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ABSTRACT

This manual is a resource guide on energy education for teaching career education from grades seven to twelve. It contains 18 student activities which are grouped into four goal oriented units. The main objectives of the project are to increase the student's understanding that: (1) Natural laws limit energy availability: (2) Energy consumption affects both man and his environment: (3) Human values and attitudes affect energy usage: and (4) Energy consumption is necessary to maintain our life style. (SB)

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IDAHO
ENERGY CONSERVATION RESOURCE GUIDE
for
CAREER EDUCATION GRADES 7-12

JOHN V. EVANS
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"The Energy Crises can be the most effective teaching aid of the decade."

S. David Freeman
Commissioner
Tennessee Valley Authority

INTRODUCTION

In recent years Idahoans have become increasingly concerned about the energy situation and aware of the importance of energy in our lives. Experts now tell us that unless some immediate steps are taken we will not be able to provide for our future energy needs as a nation. New research and technology can alleviate part of the problem but, more immediately, we must reduce energy use. An effective energy conservation program can result in substantial energy savings, extend the life of present supplies, and provide us the much needed time to explore alternatives.

Traditionally, the educational system of our country has been called on to explore and resolve societal problems. The energy situation is a unique opportunity for educators since it reflects a complex set of problems that require changes in values, attitudes and lifestyles. The instructional program in a school can examine these problems and can assist in student awareness of the alternatives and consequences of energy decisions.

This resource guide has been prepared to assist teachers in incorporating energy concerns within the school curriculum. It is intended to provide a basic framework of objectives for different subject areas and to provide examples of activities for teaching towards the stated objectives. Resources are listed to aid the teacher in developing additional activities. It is anticipated that these materials will be a starting point and that teachers will go farther in this important area of instruction.

CAREER EDUCATION

Career education is important to all subject areas. By analyzing the role of the individual, Career Education helps to develop a realistic view of the world. Understanding of the importance of energy to one's career is an essential part of that view.

The following concepts, activities and skills are included in this guide:

1. Values clarification
2. Decision making
3. Occupational skills development
4. Self awareness
5. Community awareness
6. Economic awareness
7. Occupational awareness
8. Future awareness

To facilitate their use, activities are referenced to the most appropriate subject area.

IDAHO ENERGY CONSERVATION RESOURCE GUIDE

PROJECT GOALS

This project has four goals. They are easily recalled by the following acronymn:

LUV Energy Conservation

LUV represents the key words in the first three goals.

These key words are:

1. Laws
2. Use
3. Values

The fourth goal is Energy Conservation.

Goal 1. Natural LAWS determine the availability of energy.

There are conditions and limits to our use of energy. Activities under this goal describe what energy is, what forms it takes, and how it can be converted from one form to another. These activities emphasize that all earth's resources are limited.

Goal 2. USE of energy affects both people and their environment.

Everyone depends upon energy. Activities under this goal examine how energy use affects both our natural environment and our economic, political and cultural systems. These activities emphasize that energy use influences the lifestyle for both present and future generations. Lifestyle, in turn, is influenced by our choice of technology.

Goal 3. Our VALUES determine how we use energy.

Energy problems can not be solved by technology alone. Activities under this goal encourage us to analyze our personal energy habits and to accept the responsibility for our actions. They emphasize that changes in energy use and changes in values and attitudes are inter-related. These activities offer us some tools for gathering information, for making decisions, and for providing input to our economic, political and cultural systems.

Goal 4. ENERGY CONSERVATION is necessary to maintain our lifestyle.

There are both long-run and short run solutions to energy problems. Activities under this goal encourage the development of both new energy sources and of more efficient ways to use energy. They emphasize that energy conservation is an effective and essential tool.

Teacher Note: Use this as a pre- and post- survey to see if the study of this material has affected change in student attitudes.

ENERGY ATTITUDE SURVEY

1. Do you believe there is an energy shortage? ___yes ___no ___don't know

2. Do you believe you have been given a realistic picture of the energy situation facing the United States? ___yes ___no ___don't know

3. Do you believe most Americans are energy "wasters"? ___yes ___no ___don't know

4. Do you believe most Americans are energy "conservers"? ___yes ___no ___don't know

5. Do you believe Americans are "spoiled", self indulgent and reluctant to take responsibility for the future? ___yes ___no ___don't know

6. Do you believe it is the responsibility of every U.S. citizen to conserve energy voluntarily? ___yes ___no ___ don't know

7. Do you believe Americans will conserve energy only when government controls are imposed? ___yes ___no ___don't know

8. Would you be willing to reduce your standard of living to conserve energy? ___yes ___no ___ don't know

9. Do you believe you as an individual can make an impact on energy consumption? ___yes ___no ___don't know

10. Would you conserve energy to save money? ___yes ___no ___ don't know

11. Do you think the money saved is worth the inconvenience of conserving energy? ___yes ___no ___don't know

12. Do you think the energy saved is worth the inconvenience of conserving energy? ___yes ___no ___ don't know

13. Do you feel technology will "bail us out" of the energy shortage? ___yes ___no ___ don't know

14 Do you feel you have any input or participation in the energy usage decisions made by your family? ___yes ___no ___ don't know

15 Are you going to <u>do</u> something to save energy? ___yes ___no ___don't know

Take a tally for the Energy Attitude Survey and find the percentages for each response.

GOAL 1: NATURAL LAWS DETERMINE THE AVAILABILITY OF ENERGY.

Activity 1

Objective: The student will be able to define energy and give examples to support his/her definition.

Subject Area: Science, Language Arts, Social Studies

Resource: Library Resources

Procedure: Working in small groups, students will discuss and develop their own definition of energy.

Using research methods the groups will compare scientific definitions of energy with their own.

The group will combine their own definition with those of the experts to arrive at definitions acceptable to the group. Each group's definitions will be presented to the total class for discussion.

Make a list of careers based on the definitions discussed.

Goal 1

Activity 2

Objective: The student will name and describe five industries which utilize energy to produce their products.

Subject Areas: Economics, Social Studies

Resource: Community Resources

Procedure: Given the knowledge of energy conversion each student or small group of students will interview an industry spokesperson to determine that industry's use of energy conversions.

Example: The electrical energy that runs a ski-lift in one area may come from a hydroelectric dam, while the energy that runs a ski-lift in another area may come from a coal fired plant.

Activity 3

Objective: The student will be able to identify at least two careers that would be eliminated for each identifiable resource that has been entirely consumed by the earth's inhabitants.

Subject Area: Science; Environmental Education

Resource: Library Resources

Procedure: Class room research, study, and discussions of energy resources and energy reserves.

Activity 4

Objective: The student will be able to list three types of energy used in industrial processes. He/she will further describe three careers available in each area and the skills and personality characteristics required for the job.

Subject Area: Science

Resources: Community Resources

Procedure: The class will participate in field trips to sites of energy conversion such as power plants and solar homes.

Activity 5

Objective: The student will name one energy source and three careers involved in harnessing this energy for commercial use. The student will list the job requirements for this career.

Subject Area: Science, Social Studies, Language Arts

Resources: Library Resources

Procedure: Given a list of energy sources, such as natural gas and the sun choose one source and determins through research those occupations which are involved in producing and using the energy. The students will then choose one occupation and interview a community person in this occupation to determine the personal and skill requirements for this work.

GOAL 2: USE OF ENERGY AFFECTS BOTH PEOPLE AND THEIR ENVIRONMENT.

Activity 1

Objective: The student will be able to discuss the changes in life styles as certain energy resources diminish and new resources are harnessed.

Subject Areas: Language Arts

Resources: Library resources, Career Education Materials

Procedure:
1. Have each student choose a job he/she has background knowledge about. Then have each student list and discuss all the good and adverse effects that job has on the quality of life.

2. Have each student speculate how his/her job will change in the future as some energy resources are exhausted and other sources are utilized.

Activity 2

Objective: The student will be able to identify the major forms of energy used in different occupational areas and assess how appropriate each is for that area.

Subject Areas: Science

Resource: Community

Procedure:

1. Conduct a general class discussion on the forms of energy used in different jobs.

   a. What form is now used in agricultural (health, marketing, etc.) occupations?

   b. What other forms might be used by these occupations?

   c. How would a change in the energy forms affect the training, wages, and duties of different jobs?

2. Tour a solar greenhouse and talk to greenhouse workers about the skills necessary to operate a solar greenhouse.

3. Tour a solar heated home or office building and talk to the builder about the training necessary to construct solar heated living quarters.

4. Class discussion of the job opportunities offered by new uses of energy forms.

Activity 3

Objective: The student will be able to discuss how energy affects a particular job.

Subject Area: Social Studies, Economics

Resource: Community Resource Person

Procedure: 1. Shadow a community resource person.

2. Have a class discussion.

Activity 4

Objective: The student will be able to identify how energy needs affect the employment picture of a particular business.

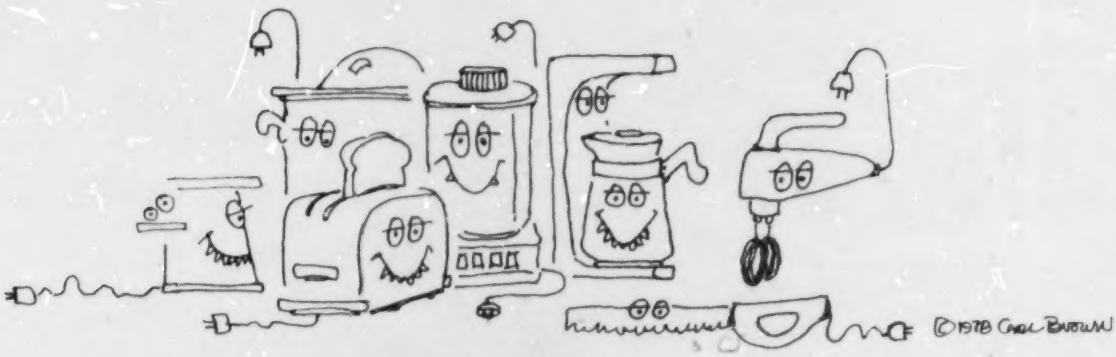
Subject Areas: Business, Social Studies

Resources: Community Resources

Procedure: Field trips and industry interviews either as a class group, mini-groups or as individuals to a community business or industry.

1. Conduct field trips and --

2. Discuss how energy impacts the businesses and individuals visited.



Activity 5

Objective: The student will list five home energy "needs" and five home energy "wants" and the sources of this energy at the present time.

Subject Areas: Home Economics, Vocational Ed., Industrial Arts.

Resources: Home

Procedure: Have students assess their own home energy needs for a day.

Activity 6

Objective: The student will develop a list of energy related jobs that may become obsolete and a list of energy related jobs that may emerge as new career opportunities.

Subject Areas: Science, Business

Resources: Library Resources

Procedure:

1. Groups of students will be assigned an area of Idaho (the nation, the western hemisphere, or the world) to research for economic base, energy sources and quality of life.

2. Given the above information each group will simulate a possible energy shortage problem and its possible solutions.

3. Within the solutions to above simulation, students will suggest careers or jobs made obsolete and new career openings created.

GOAL 3: OUR VALUES DETERMINE HOW WE USE ENERGY.

Activity 1

Objective: The student will be able to identify the workers' values and attitudes concerning his/her use of energy on the job.

Subject Areas: Psychology, Biology

Resources: Community

Procedure: Shadowing experiences for each student in an occupation of their particular interest.
Post activity discussion of similarities and differences in values and attitudes of workers.

Activity 2

Objective: The student will develop a program to educate workers' attitudes towards conserving energy.

Subject Areas: Psychology, Biology

Resources: Community Resource People

Procedure:

1. Have a speaker from business and/or government agencies discuss what programs they have used in the past to conserve energy by changing attitudes. Have the speaker describe in detail how the program was implemented and how successful it was.

2. Have each student develop a program for a specific occupation. Allow him/her to make posters, develop slogans or design workshops.

3. Let students show and discuss their program with community resource trainers.

Activity 3

Objective: The student will be able to identify what person or persons are responsible or concerned about the energy demands, supplies, and cost for the business in which they are interested.

Subject Areas: Government, Social Studies

Resources: Community

Procedure:

1. While working with a community resource trainer the student will:

   a. Determine who is responsible for paying energy bills, who determines their energy demands, who supplies the energy for the business.

2. While in the classroom students will make a flow chart showing all agencies and people involved in the final delivery of energy to the business.

Activity 4

Objective: The student will be able to identify personal energy habits directly related to his/her occupation that conserves or wastes energy and how these personal habits may effect his/her job in the future.

Subject Areas: Psychology, Social Studies, Business, Economics

Resources: Community Resource Person

Procedure:

1. While shadowing a community resource person, the student will observe and discuss the personal energy habits necessary for that job.

2. Have students make posters to illustrate personal habits which waste energy on the job.

3. Have students compare personal energy habits of workers.

   a. Are these habits different with different occupations?

Activity 5

Objective: The student will be able to describe how an energy shortage affects different jobs in different ways.

Subject Areas: Psychology, Economics, Business Education, Social Studies, Vocational Education.

Resources: Library and Community Resources

Procedure: Two students will role play two different jobs that are both affected by an energy shortage.

They will hold an "argument" about possible solutions in front of the class.

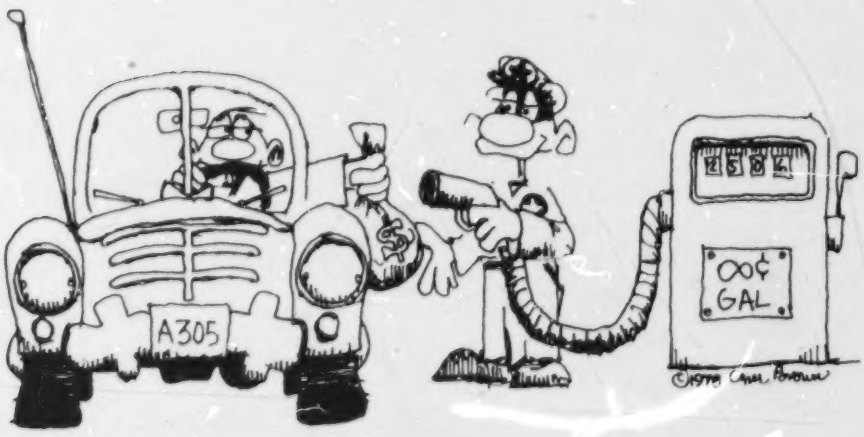
A third student will decide who "won" the argument.

Hold a class discussion on how the "solution" might affect the lives of both people.

Sample Roles:

Person A (Employer)
You are the owner of a gas station. Government price controls prevent you from raising your prices. However, oil companies are charging you more for delivery and inflation of rent, wages and taxes continually eats away your profits. What can you do to save your business?

Person B (Employee)
You are attendent of a gas station whose owner is considering laying you off because his business can no keep up with inflation. You enjoy your job and jobs like this are very difficult to get now because many gas stations are having the same problem. What choices do you have in the matter?



GOAL 4: ENERGY CONSERVATION IS NECESSARY TO MAINTAIN OUR QUALITY OF LIFE.

Activity 1

Objective: The student will be able to list and discuss those kinds of careers that could possible be created as a result of technological advancements in solar, geothermal and other renewable energy resources.

Subject Areas: Social Studies, Economics

Resources: Library Resources

Procedure: Research, field trips and classroom discussion on possible new energy resources and systems. (Plan trips to solar houses, geothermal ponds, etc., if available.)

Activity 2

Objective: The student will be able to identify at least five (5) careers that directly relate to the conservation of natural resources.

Subject Areas: Science, Economics

Resources: Community and Resource People

Procedure:
1. Classroom resource speaker or field trips on conservation that illustrate how conservation can significantly alter the energy shortage.
2. Follow up research into careers in the conservation of natural resources.

GLOSSARY

ACCELERATION. The time rate of change of velocity in either speed or direction.

ALTERNATING CURRENT (AC). An electric current whose direction of flow is changed at periodic intervals (many times per second).

ATOM. The smallest particle of an element which can enter into a chemical combination. All chemical compounds are formed of atoms, the difference between compounds being attributable to the nature, number, and arrangement of their constituent atoms.

ATOMIC ENERGY. The constitutive internal energy of the atom which was absorbed when it was formed; Energy derived from the mass converted into energy in nuclear transformation.

BLACKOUT. A total power failure unintentionally caused by storm damage, equipment failure, or overloaded utility equipment. An exceptional situation in which all power is deliberately cut off by electrical generating facilities.

BLANKET INSULATION. Cotton fiber, mineral wool, or wool fiber made into varying thicknesses in a length.

COAL. Solid, combustible, organic hydrocarbon formed by the decomposition of vegetable material without free access to air.

COAL GASIFICATION. The conversion of coal to a gas suitable for use as a fuel.

COMBUSTION. Burning; technically, a rapid oxidation accompanied by the release of energy in the form of heat and light. It is one of the three basic contributing factors causing air pollution. The others are attrition and vaporization.

COMFORT ZONE. The proper temperature, humidity, and air movement to create a feeling of comfort.

CONDUCTOR (ELECTRICAL). A material capable of carrying an electrical current.

CONSERVATION. The care or management of natural resources.

CONSERVATION OF MATTER AND ENERGY (LAW OF). The sum of the potential and kinetic energy of an ideal energy system remains constant.

CONSERVE. To manage or use wisely.

CONVECTION. A transfer of energy by moving masses of matter, such as the circulation of a liquid or gas.

CONVENTIONAL HYDROELECTRIC PLANT. A hydroelectric power plant that utilizes streamflow only once as the water passes downstrem, as opposed to a pump-storage plant which re-circulates all or a portion of the streamflow in the production of power.

CRUDE OIL. Liquid fuel formed from the fossils of animals and plants; petroleum as it comes from the ground.

CURRENT (ELECTRIC). The rate of transfer of electricity.

CURTAILMENT. Cutting back the use of energy resources as opposed to conserving or wisely using energy resources.

DIRECT CURRENT (DC). An electric current that flows in only one direction through a circuit.

DIRECT ENERGY CONVERSION. The process of changing any other form of energy into electricity without machinery that has moving parts. For example, a battery changes chemical energy into electricity by direct energy conversion.

DOUBLE GLAZED WINDOW. Two panes of glass factory-sealed together with a small air space between them. Double glazing has about twice the R-value of single glazing.

EFFICIENCY. The ratio of the useful work performed to the amount of energy used in the process.

ELECTRICAL ENERGY. The energy associated with electric charges and their movements. Measured in watt hours and kilowatt hours. One watt-hour equals 860 calories.

ELECTROCHEMICAL CELL. A cell in which chemical energy is converted to electric energy by a spontaneous oxidation-reduction reaction.

ELECTRON. The electron is a small particle having a unit of negative electrical charge, a small mass, and a small diameter. Every atom consists of one nucleus and one or more electrons.

ELEMENTS. Elements are substances which cannot be decomposed by the ordinary types of chemical change, or made by chemical union.

ENERGY. The capability of doing work. Potential energy is energy due to position of one body with respect to another or relative parts of the same body. Kinetic energy is due to motion.

ENTROPY. Entropy is the capacity factor for isothermally unavailable energy. Every spontaneous process in nature is characterized by an increase in the total entropy of the bodies concerned in the process.

ENVIRONMENT. The sum of all external conditions and influences affecting the life, development, and ultimately the survival of an organism.

FIRST LAW OF THERMODYNAMICS. (Also called the Law of Conservation of Energy). Energy can be neither created nor destroyed.

FISSION. A nuclear reaction from which the atoms produced are each approximately half the mass of the parent nucleus. In other words, the atom is split into two approximately equal masses. There is also the emission of extremely great quantities of energy since the sum of the masses of the two new atoms is less than the mass of the parent heavy atom. The energy released is expressed by Einstein's equation, $E = Mc^2$.

FLYWHEEL. A method of energy storage working on the principle of a spinning wheel. By its inertia, a spinning wheel stores mechanical energy.

FOAM INSULATION. (Styrofoam: (2) Rigid foam boards; or (3) Liquid foam insulation.

FOSSIL FUELS. Coal, oil, natural gas, and other fuels originating from geologic deposits of ancient plant and animal life depending on oxidation for release of energy.

FUEL. A substance used to produce heat energy, chemical energy by combustion, or nuclear energy by nuclear fission.

FUEL CELL. A device in which fuel and oxygen are combined to produce chemical energy that is converted directly into electricity.

FUSION (ATOMIC). A nuclear reaction involving the combination of smaller atomic nuclei or particles into larger ones with the release of energy from mass transformation. This is also called a thermonuclear reaction by reason of the extremely high temperature required to initiate it.

FUSION. A reaction in which light nuclei combine to form an atom with greater mass.

GAS. A state of matter in which the molecules are practically unrestricted by cohesive forces. A gas has neither definite shape nor volume.

GASOLINE. Mixture of hydrocarbons obtained from petroleum.

GENERATOR. A device that converts heat or mechanical energy into electrical energy.

GEOTHERMAL. As applied to power generation, the use of heat energy obtained through the medium of hot water or steam coming from beneath the earth's surface.

GEOTHERMAL ENERGY. The heat energy available in the earth's subsurface believed to have been produced by natural radioactivity. The thermal gradient of the earth's crust is such that the temperature in a deep well or mine increases by about $1^{\circ}F$ for each 100 ft. of depth.

GRAM. A unit of mass in the metric system; 10^{-3} standard kilogram.

KILOWATT-HOUR (KWH). The amount of work or energy delivered during the steady consumption of one kilowatt of power for a period of one hour; equivalent to 3.412 BTUs.

LIGHT. Radiant energy which an observer can see.

LIQUIFIED NATURAL GAS (LNG). Natural gas that has been changed into a liquid by cooling to about -260°F (-160°C) at which point it occupies about 1/600 of its gaseous volume at normal atmospheric pressure; thus, the cost of shipping and storage is reduced.

MECHANICAL ENERGY. The kind of energy that is released to make objects move.

MEGAWATT (MW) A unit of power equal to 1,000 kilowatts or one million watts.

METHANE. Colorless, nonpoisonous, and flammable gaseous hydrocarbon; emitted by marshes and by dumps undergoing decomposition.

NATURAL GAS. Naturally-occurring mixtures of hydrocarbon gases and vapors occurring naturally in certain geologic formations; usually found associated with oil.

NONRENEWABLE RESOURCES. Depletable energy resources such as the fossil fuels - coal, gas and oil.

NUCLEAR ELECTRIC POWER PLANT. One in which heat for raising steam is provided by fission rather than combustion of fossil fuel.

NUCLEAR (ATOMIC) FUEL. Material containing fissionable uranium of such composition and enrichment that, when placed in a nuclear reactor, will support a self-sustaining fission chain reaction and produce heat in a controlled manner for process use.

NUCLEAR POWER. Electric power produced from a power plant by converting the energy obtained from nuclear reaction.

NUCLEAR POWER PLANT. Any device, machine, or assembly that converts nuclear energy into some form of useful power, such as mechanical or electrical power. In a nuclear electric power plant, heat produced by a reactor is generally used to make steam to drive a turbine that, in turn, drives an electric generator.

NUCLEAR REACTION. A reaction involving a change in an atomic nucleus, such a fission, fusion, neutron capture, or radioactive decay, as distinct from a chemical reaction, which is limited to changes in electron structure surrounding the nucleus.

OFF-PEAK. Energy supplied during periods of relatively low system demands.

OIL SHALE. Sedimentary rock containing solid organic matter (kerogen) that yields substantial amounts of oil when heated to high temperatures.

GREENHOUSE EFFECT. A method of using solar radiation to warm underheated areas (window treatments are opened to allow the window to admit and trap the sun's heat).

GROSS NATIONAL PRODUCT (GNP). A measure of economic activity which is the total market value of all goods and services produced in the country. Depreciation and other allowances for capital consumption are not deducted.

HEAT. Energy possessed by a substance in the form of kinetic energy, usually measured in calories or, in space heating. by the British thermal unit. Heat is transmitted by conduction, convection, or radiation.

HEAT CAPACITY. That quantity of heat required to increase the temperature of a system or substance one degree of temperature. It is usually expressed in calories per degree Celsius.

HEAT ENERGY. Energy that causes an increase in the temperature of an object. It may change the object from solid to liquid or from liquid to gas.

HEAT PUMP. A device that absorbs heat from the outside air and pumps it into the house. It works in reverse as a standard air conditioner for cooling.

HORSEPOWER. A unit that measures the rate at which energy is produced or used. A man doing heavy manual labor produces energy at the rate of about .08 horsepower.

HYDROELECTRIC PLANT. An electric power plant in which the turbine-generators are driven by falling water.

HYDROELECTRICITY. Electricity production by water-powered turbine generator.

HYDROLOGY. The science dealing with the properties, distribution, and circulation of water and snow.

HYDROPOWER. Power by falling water.

INSULATION A substance that insulates is one that can slow down the flow of heat or sound.

INTERNAL COMBUSTION ENGINE. Energy is supplied by a burning fuel which is directly transformed into mechanical energy by controlled combustion.

JOULE. A metric unit of work or energy; the energy produced by a force of one newton operating through a distance of one meter.

KILOCALORIE. Heat energy equal to 4.19×10^3 joules.

KILVOLT (KV). 1,000 volts.

KILOWATT (KW). The unit of power equal to 1,000 watts, 3.413 BTUs, or 1,341 horsepower. Roughly, the power of one kw is capable of raising the temperature of a pound (pint) of water $1^{o}F$ in one second.

OIL SPILL. The accidental discharge of oil into oceans, bays, or inland waterways. Methods of oil spill control include chemical dispersion, combustion, mechanical containment, and absorption.

OPEC (ORGANIZATION OF PETROLEUM EXPORTING COUNTRIES). An organization of countries in the Middle East, North Africa, and South America which aims at developing common oil-marketing policies.

PEAKING. Power plant operation to meet the highest portion of the daily load.

PEAKING CAPABILITY. The maximum peak load that can be supplied by a generating unit, station, or system in a stated period of time. For a hydroproject, the peaking capability would be equal to the maximum plant capability only under favorable pool and flow conditions. Often the peaking capability may be less due to reservoir drawdown or tailwater encroachment.

POWER. The time rate at which work is done. If an amount of work (w) is done in time (t) the power or rate of doing work is $P = w/t$. Power will be obtained in watts if w is expressed in joules and t in seconds.

PUMPED HYDROELECTRIC STORAGE. The only means now available for the large-scale storage of electrical energy. Excess electricity produced during periods of low demand is used to pump water up to a reservoir. When demand is high, the water is released to operate a hydroelectric generator. Pumped energy storage only returns about 66 percent of the electrical energy put into it, but costs less than an equivalent generating capacity.

PUMPED STORAGE PLANT. A hydroelectric power plant which generates electric energy for peak load use by utilizing water pumped into a elevated storage reservoir during off-peak periods.

R-VALUE. Thermal resistance; computed by the conductivity divided into one. The measure of resistance to heat flow.

RECLIMATION. Act or process of reclaiming; for example, strip-mined land should be reclaimed -- replanted and leveled.

RENEWABLE RESOURCES. Nondepletable resources; for example, the sun.

RESERVES. The amount of a natural resource known to exist and expected to be recovered by present-day techniques.

RESOURCES. The estimated total quantity of a natural resource such as minerals in the ground; includes undiscovered mineral reserves.

SECOND LAW OF THERMODYNAMICS. One of the two "limit" laws which govern the conversion of energy. Referred to here as the "heat tax", it can be stated in several equivalent forms, all of which describe the inevitable passage of some energy from useful to a less useful form in any energy conversion.

SOLAR CELL. A photovoltaic cell which converts radiant energy from the sun into electrical energy.

SOLAR ENERGY. Radiation energy from the sun falling upon the earth's surface.

SOLID WASTE. Useless, unwanted, or discarded material with insufficient liquid content to be free flowing.

STATIC ELECTRICITY. Electricity at rest.

STEAM-ELECTRIC PLANT. A plant in which the prime movers (turbines) connected to the generators are driven by steam.

STOCKPILE. A storage pile or reserve supply of an essential raw material; for example, coal is stockpiled in the open air for storage purposes.

STRIP-MINING. A process in which rock and topsoil strata overlying ore or fuel deposits are scraped away by mechanical shovels. Also known as surface mining.

TECHNOLOGY. Applied science.

THERMAL EFFICIENCY. The ratio of the electric power produced by a power plant to the amount of heat produced by the fuel; a measure of the efficiency with which the plant converts thermal to electrical energy.

THERMAL ENERGY. The total potential and kinetic energy associated with the random motions of the particles of a material.

THERMAL PLANT. A generating plant which converts heat energy to electrical energy. Such plants may burn coal, gas, oil, or use nuclear energy to produce thermal energy.

THERMAL POLLUTION. Degradation of water quality by the introduction of a heated effluent. Primarily a result of the discharge of cooling waters from industrial processes, particularly from electrical power generation.

THERMODYNAMICS. The science and study of the relationship between heat and mechanical work.

TRANSMISSION. The act or process of transporting electric energy in bulk from a source or sources of supply to other utility systems.

TRANSMISSION LINES. Wires or cables through which high voltage electric power is moved from point to point.

TURBINE. A motor, the shaft of which is rotated by a stream of water, steam, air, or fluid from a nozzle and forced against the blades of a wheel.

VAPOR. The words vapor and gas are often used interchangeably. Vapor is more frequently used for a substance which, though present in the gaseous phase, generally exists as a solid or liquid at room temperature. Gas is more frequently used for a substance that generally exists in the gaseous phase at room temperature.

VAPORIZATION. The change of a substance from a liquid or solid state to the gaseous state. One of three contributing factors to air pollution; the other are attrition and combustion.

VOLT. The unit of electromotive force. It is the difference in potential required to make a current flow through a resistance.

VOLTAGE. The amount of force employed to move a quantity of electricity; measured in volts.

WATER VAPOR. Water in the form of a gas.

WATT (W). A unit of measure for electric power equal to the transfer of one joule of energy per second. The watt is the unit of power most often associated with electricity (1 horsepower = 746 watts) determined by multiplying required volts by required amperes (volts x amps = watts).

WEATHERSTRIPPING. Reduces the rate of air infiltration by making sure that all doors and windows fit their frames snugly.

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